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GB 2305233 A GB 0422550 A GB 0370687 A
US 4508957 A

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(54) Heater block for a throughflow heater

(57) A heater block (1) for an electrically heated throughflow heater comprises a housing which has a water flow channel (11) and is provided with heating coils. The housing is formed by two housing shell members (3, 5) which bear against one another by corresponding bearing surfaces (7, 8) and are sealingly connected together and which form the water flow channel (11) therebetween. The heating coils and at least one control or other functional element of the throughflow heater are arranged between the housing shell members (3, 5).

FIG.1

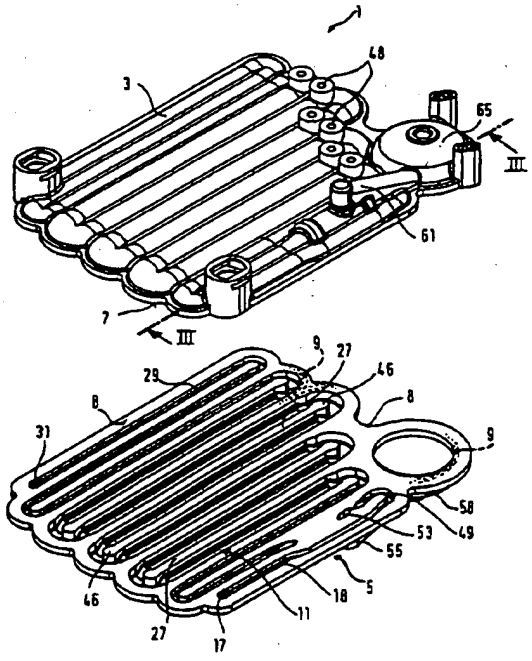

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FIG.1

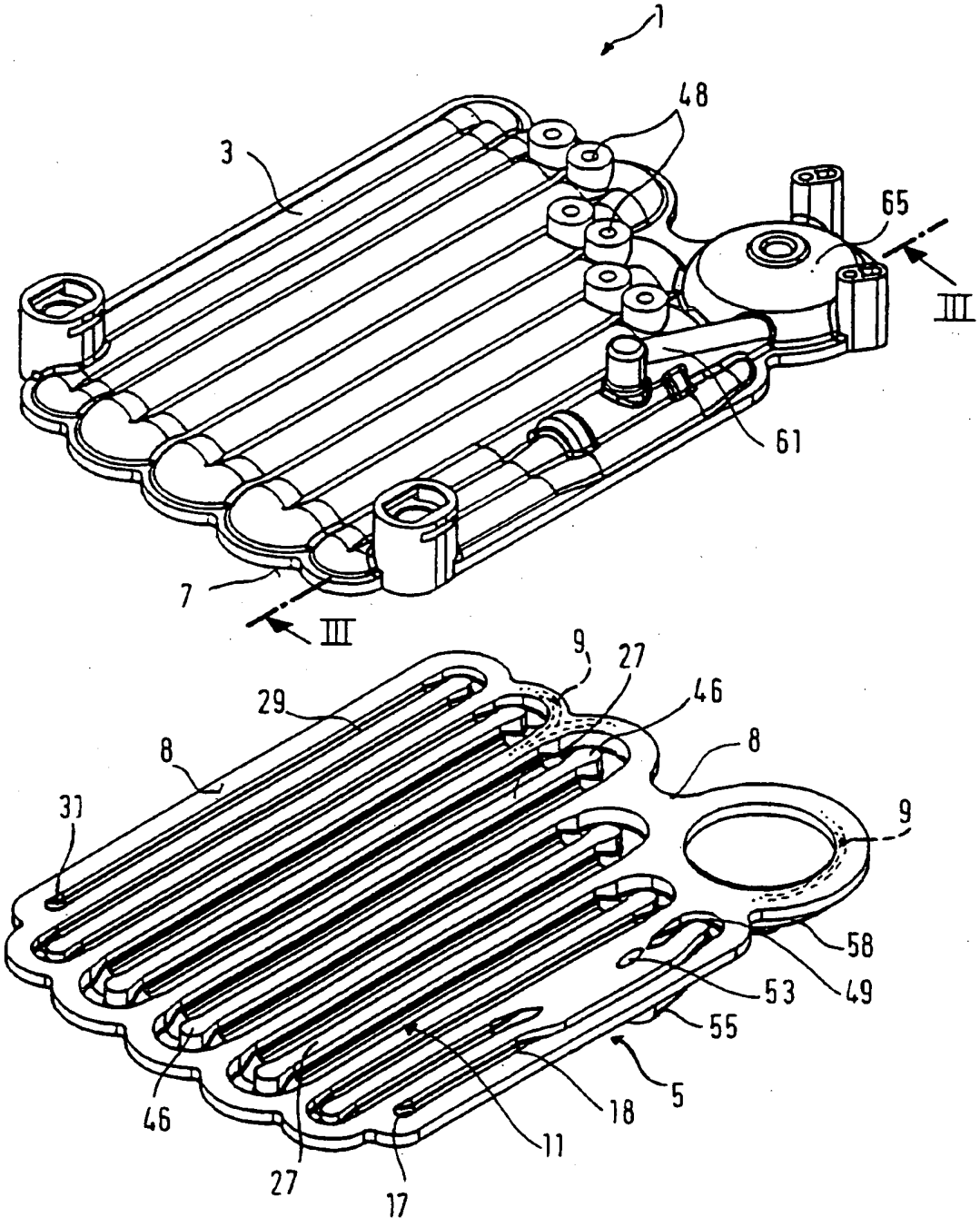

FIG.2

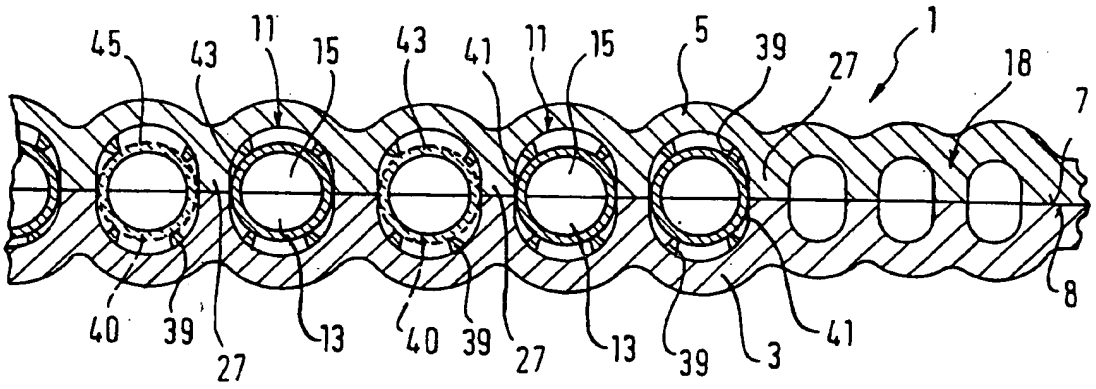
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FIG.3

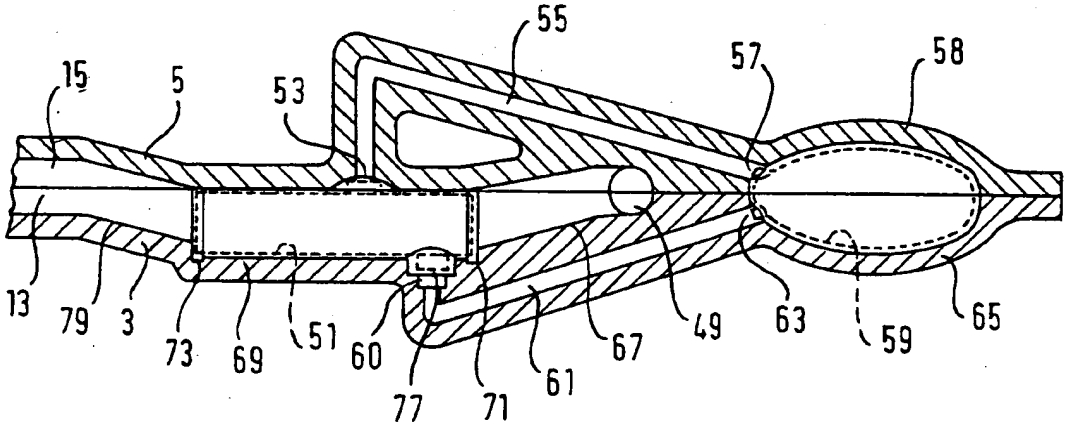
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FIG.4

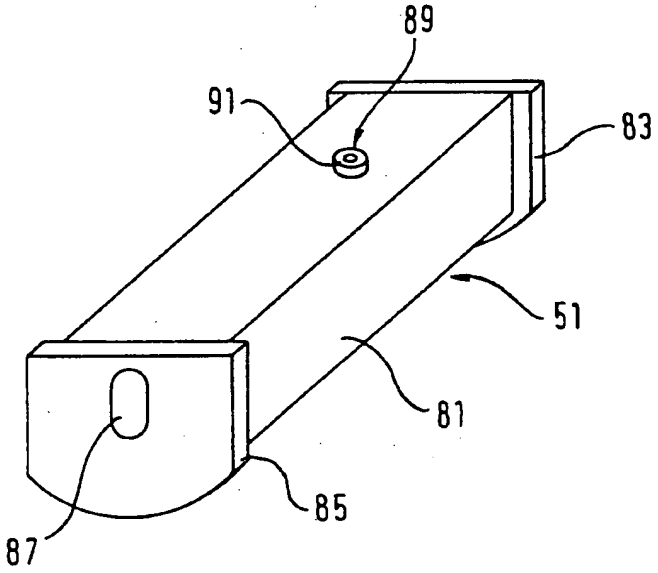
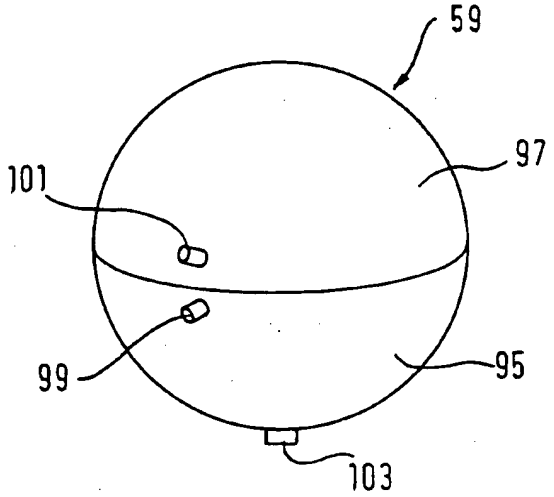


FIG.5



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HEATER BLOCK FOR A THROUGHFLOW HEATER

The present invention relates to a heater block for a throughflow heater and to a throughflow heater equipped with such a block.

A heater block is known in the case of the throughflow heater type DDLT 24 produced by AEG Hausgeräte GmbH, in which a water flow channel extends in meander-like fashion in the heater block. The heater block comprises a channel block with mutually parallel, tubular channel bores, as well as a cover part and a base part. Channel bends are formed in each of the cover part and the base part and deflect the water, which flows from a channel bore out of an end face of the channel block, through 180° and return it to a corresponding adjacent bore of the channel block. In order to achieve a heater block which is pressure-tight and sealed even at a water pressure of 30 bar, appropriate seals are laid between the channel block and the cover part or base part and the channel block is firmly screw-connected with the cover part and the base part. Connected to the water flow channel outside the housing of the heater block are a venturi nozzle for detection of the water throughflow quantity and a differential pressure switch with a diaphragm cell, which serves for conversion of the throughflow quantity, in an actuation path for switching means of the throughflow heater.

There remains scope, however, for improvement of production and assembly aspects of heater blocks of such a kind.

According to the present invention there is provided a heater block for a throughflow heater, comprising a housing having a water flow channel and provided with heating coils, wherein the housing is formed by two housing shell members which lie against one another by corresponding bearing surfaces and are sealingly connected together and which form the water flow channel therebetween, and the heating coils and at least one further functional element of the throughflow heater are arranged between the housing members. Due to the division of the housing into two housing members, receiving regions for different functional elements of the throughflow heater can be produced in simple manner. The insertion or mounting of the functional elements is particularly simple due to the open shell construction. Moreover, additional connecting lines, which were previously required between the functional elements and particularly the water flow channel and the sealing thereof, can be dispensed with, and a compact construction of the heater can be

achieved by the integration of the functional elements into the heater block. The awkward threading in of the U-shaped heating coils, which are to be located in the water flow channel, into the heater block is avoided. The heating coils can be laid in problem-free manner in one of the two housing members during assembly of the heater block and held in the water flow channel by the mounting of the second housing member.

It is particularly advantageous in terms of production and assembly technique if the two housing members are connected together by welds. In that case the otherwise required sealing and connecting elements between the housing members are redundant and at the same time a sufficient stability of the heater block even at water pressures up to 30 bar is guaranteed. Due to the size of the heater block or housing members a friction welding method is particularly suitable for that purpose.

Advantageously, a venturi nozzle with a nozzle housing body is arranged as a separate part between the housing members. The connection of the venturi nozzle to the heated water flow channel is thereby possible in a manner which is particularly favourable in cost. The sealed connection of a pressure measuring opening of the venturi nozzle to a surface of the nozzle housing can be achieved in simple manner if the opening is surrounded by an elevated bead which projects above the surface and is integral with the nozzle housing body. By means of the bead there is then achieved by the welding process, especially the friction welding process, a tight connection between the nozzle housing body in the region of the pressure measuring opening and the corresponding housing member. In that case it is particularly advantageous if the venturi nozzle consists of a material similar to the corresponding housing member with respect to welding characteristics.

Further advantages, especially in terms of assembly and connecting technique, can be achieved if a diaphragm cell of a differential pressure switch is arranged between the housing members.

In order to be able to guarantee a secure seating of the functional elements during assembly of the heater block, at least one of the housing members can have receiving recesses to provide a firm seat for the functional elements. So that the movement of the two housing members relative to one another during the friction welding is not made more difficult by a functional element projecting out of the members, and at the same time a simple production technique for the housing members is possible, the recesses can be

formed to be de per in one of the members, whilst the other member is substantially thinner by comparison therewith and is formed to be substantially flat in the region of the bearing surface.

An embodiment of the present invention will now be more particularly described by reference to the accompanying drawings, in which:

Fig. 1 is a perspective exploded view of two housing members of a heater block embodying the invention;

Fig. 2 is a sectional view, to enlarged scale and greatly simplified, of the heater block with the housing members welded together;

Fig. 3 is a sectional view, substantially along the line III-III of fig. 1 and in simplified form and to enlarged scale, of part of the housing;

Fig. 4 is a perspective view of a venturi nozzle for installation in the heater block; and

Fig. 5 is a perspective view of a diaphragm cell, in expanded state, for installation in the heater block.

Referring now to the drawings, there is shown a heater block 1 which, as depicted in Fig. 1, has a generally flat lower housing shell 3 and a correspondingly constructed upper housing shell 5. The two housing shells 3 and 5 are made of the plastics material PPE with a glass-fibre component and have mutually corresponding bearing surfaces 7 and 8 at the mutually facing sides, between which water is led through the heater block 1. These bearing surfaces extend substantially at the circumferential edges and from there, going in from two mutually opposite sides and interengaging in comblike manner, over the facing surfaces of the two housing shells 3, 5. Extending in each of the bearing surfaces 7 and 8 are narrower connecting surfaces 9, at which the lower housing shell 3 and the upper housing shell 5 are welded together. The connecting surfaces 9 are, for reasons of simpler illustration, indicated in Fig. 1 only in sections by broken lines. They run around a water flow channel 11, which is formed between the two housing shells 3 and 5 and extends in meander-like fashion in the heater block 1, in order to securely seal this.

The channel 11 is realised by a lower groove 13 extending in meander-like fashion in the joint side of the lower housing shell 3 and an upper groove 15 correspondingly formed in the joint side of the upper housing shell 5 (Fig. 2). A water feed 17 (Fig. 1) of the heater block 1 is formed in the initial - in terms of flow - section of the channel 11 by an opening in the lower housing shell 3 (Fig. 1) of the heater block 1. This feed is connectible to corresponding water lines, which are not illustrated, of the throughflow heater. A first electrical insulating channel 18 appropriately constructed in accordance with safety regulations extends out from the water feed 17.

Two support ribs 39 disposed opposite one another in pairs are arranged in the water flow channel 11 respectively in the upper groove 15 and lower groove 13. These form a receiving region 40 (indicated in Fig. 2 by broken lines), which is substantially circular in cross-section, for three heating coils 41, 43 and 45 arranged in the heater block 1 (Fig. 2). The support ribs 39 extend substantially over the entire length of the heated region of the channel 11. The heated region of the channel 11 has a cross-sectional area for the flowing water which is of substantially the same size over the entire path. The cross-sectional area of the heated region is greater than that in the region of the first insulating channel 18. Two adjacent, mutually parallel and rectilinearly extending length portions of the heated region of the water flow channel 11 are watertightly separated from one another in each case by a separating web 27. These webs extend from the oppositely disposed circumferential edges of the lower and upper housing shells 3 and 5, whilst interengaging in comblike manner, in rod-shape along the rectilinearly extending heated section of the water flow channel 11 to an end portion 46 enlarged to be head-shaped. The meander-like form of the water flow channel 11 in the heater block 1 is thereby defined.

Each separating web 27 is formed to the extent of about one half by the lower housing shell 3 and one half by the upper housing shell 5 (Fig. 2). Adjacent to the region heated by the heating coils 41, 43 and 45, the cross-section of the water flow channel 11 is further reduced, by corresponding shaping, in the region of the water feed 17. This region of the channel 11 serves as a second electrical insulating channel 29. Provided at the end section thereof is a water outlet 31, which is realised by a corresponding opening in the lower housing shell 3.

The heating coils are laid substantially directly one after the other in U-shaped manner around the corresponding separating webs 27 and are fixable in position by right-angularly bent-over terminal pins (not shown) protruding into corresponding openings 48 in the lower housing shell 3 (Fig. 1), so that they project out of the heater block 1 for the purpose of electrical connection thereto. The heating coils are initially placed in the lower groove 13 of the lower housing shell 3 on the support ribs 39 and the terminal pins 47 are plugged into the openings 48. By virtue of the spatial arrangement of the openings 48 in the lower housing shell 3 the heating coils 41, 43 and 45 extend from one heating coil to the next in flow direction over a greater length.

The cold water fed into the first insulating channel 18 flows, after a first 180° deflection, through a venturi nozzle 51 held between the two housing shells 3 and 5, as described in the following with reference to Figs. 3 and 4. A differential pressure, which corresponds to the throughflow speed of the water flowing through the heater block 1, is measured in known manner in the venturi nozzle. For measurement of this differential pressure the upper housing shell 5 has a first pressure measuring opening 53, which is connected by way of a first connecting channel 55, which is formed integrally with the upper housing shell 5, with a first pressure opening 57 in a first bearing shell 58, which is equally formed integrally with the upper housing shell 5, for a diaphragm cell 59 for a differential pressure switch of the throughflow heater (not shown). Correspondingly, a second pressure in the venturi nozzle 51 is measured and passed on from a second pressure measuring opening 60 in the lower housing shell 3 by way of a second connecting channel 61 to a second pressure opening 63 in a second bearing shell 65. The first bearing shell 58 forms, together with the second bearing shell 65, which is correspondingly formed at the lower housing shell 3, a receiving space for the diaphragm cell 59.

As stated, the water flow channel 11 is formed, by the lower and upper grooves 13 and 15, between the lower housing shell 3 and the upper housing shell 5. After a deflection portion 49 of the first insulating channel 18, the base of the lower groove 13 has an inlet incline 67. This ends in a first trough-shaped receiving recess 69 of the lower housing shell 3. The venturi nozzle 51, which is shown by broken lines in Fig. 3 and perspectively in Fig. 4, is seated in the recess 69. Adjacent to the inlet incline 67, a similarly trough-shaped, but slightly wider and deeper, channel-shaped entry sealing region 71 is arranged at the inlet end of the recess 69 and a corresponding outlet sealing region 73 is arranged at the outlet end section of the recess 69. The second pressure measuring opening 60, with an O-ring

receiving region 77, is formed in the bas of the recess 69. An outlet incline 79 corresponding to th inl t incline 67 is connected to the outlet sealing region 73. The depth of the groove 15 of the upper housing shell 5 increases along the outlet incline 79, as also in the region of the inlet incline 67, until the water flow channel 11 is formed equally by the two grooves 13 and 15.

A nozzle housing body 81 of the venturi nozzle 51 is inserted into the recess 69 and is constructed to be trough-shaped in correspondence therewith. An inlet sealing bead 83 and an outlet sealing bead 85 of the body 81 are watertightly seated in the corresponding sealing regions 71 and 73. The water flowing through the water flow channel 11 flows into a water entry opening (not shown) of the venturi nozzle 51, passes through this and exits the venturi nozzle 51 by way of a water exit opening 87. A first measuring opening 89 for measuring the first pressure along the flow in the venturi nozzle 51 is provided at the flat upper side of the nozzle housing body 81. The opening 89 is surrounded by an elevated annular bead 91 formed integrally with the nozzle housing body. During welding of the two housing shells 3 and 5, the bead 91 is welded to the upper housing shell 5, whereby a pressure-tight connection between the opening 89 and the pressure opening 57 is produced. Provided at the underside of the nozzle housing body 81 is a stub pipe, with a second measuring opening (not shown), which plugs into the second pressure measuring opening 60. Sealing is effected by a suitable sealing ring (not shown).

The pressures measured by the venturi nozzle 51 are passed to the first and second pressure openings 57 and 63 of the two bearing shells 58 and 65. The diaphragm cell 59 is arranged in the receiving space formed between these shells. The diaphragm cell 59 consists, in known manner, of a cell lower part 95, a cell upper part 97 and a separating diaphragm placed therebetween, with a switch plate and a switch plunger (not shown). With the help of first and second pressure stub pipes 99 and 101 and sealing elements, which are not shown, the diaphragm cell is pressure-tightly flange-connected to the two corresponding pressure openings 57 and 63. The diaphragm cell 59 is plugged into the base of the second bearing shell 65 by a tubular guide projection 103. The switch plunger is displaceably guided in the interior of the projection 103 and projects out of a corresponding opening of the lower housing shell 3. By means of the diaphragm cell 59, switching-on of the heating power for the heating coils 41, 43 and 45 for heating the water is controllable in dependence on the throughflow quantity in the water flow channel 11.

The heater block is not restricted to hydraulically controlled throughflow heaters, but can also be used with lectronically controlled throughflow heaters, for example, in conjunction with a safety pressure-limiting device.

CLAIMS

1. A heater block for a throughflow water heater, comprising a housing formed by a plurality of housing members, which bear against teach other at bearing surfaces thereof and are sealingly connected together and which form a water flow channel therebetween, and a plurality of heating elements and at least one further functional element arranged between the housing members.

2. A heater block as claimed in claim 1, wherein the housing members are welded together.

3. A heater block as claimed in claim 1 or claim 2, comprising a venturi nozzle unit arranged between the housing members, the nozzle unit having a nozzle body.

4. A heater block as claimed in claim 3, wherein the nozzle body is provided in a surface thereof with a pressure measuring opening surrounded by a projecting bead formed integrally with the nozzle body.

5. A heater block as claimed in claim 3 or claim 4, wherein the nozzle body and the housing members have substantially the same characteristics with respect to weldability of the constituent material.

6. A heater block as claimed in any one of the preceding claims, comprising a diaphragm cell of a differential pressure switch, the cell being arranged between housing members.

7. A heater block as claimed in any one of the preceding claims, wherein at least one of the housing members is provided with recesses for the heating and further functional elements.

8. A heater block as claimed in claim 7, wherein the recesses are provided in only said at least one housing member and the or each other housing member is thinner than said at least one member and substantially flat in the region of its bearing surface.

9. A heater block substantially as hereinbefore described with reference to the accompanying drawings.

10. A throughflow water heater comprising a heater block as claimed in any one of the preceding claims.

The Patent Office

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Application No:	GB 9725868.5	**Examiner:**	Mike Henderson
Claims searched:	1 to 10	**Date of search:**	13 March 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): F24H 1/10 1/12 1/14 1/16 9/00 9/02 9/14 9/20

Other: ONLINE:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X,P	GB 2305233A	(WELWYN COMPONENTS LTD) (Fig.2 & pages 2 - 4 particularly relevant)	1,2,7 & 10
X	GB 422550	(GLATZ) (Whole disclosure relevant)	1 & 10
X	GB 370687	(DARBY) (Figs 1 to 4 particularly relevant)	1,7 & 10
X	US 4508957	(ROCCHITELLI) (Figs 3 & 4 and corresponding description particularly relevant)	1,7 & 10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.